

STANDARD TREATMENT WORKFLOW (STW)

Adult Tubercular Meningitis

Dhruva Chaudhry¹, Ashutosh N Aggarwal², Anil Kumar Jain³, Ashwani Khanna⁴, Camilla Rodrigues⁵, Jai Bhagwan Sharma⁶, Jyotirmay Biswas⁷, Kusum Sharma⁸, Mandira Varma-Basil⁹, Manish Modi¹⁰, Manjula Datta¹¹, Narayan Jana¹², Nitish Naik¹³, Priscilla Rupali¹⁴, Rajesh Malhotra¹⁵, Ramprasad Dey¹⁶, Ritesh Aggarwal¹⁷, Rohit Bhatia¹⁸, Roy Thankachen¹⁹, Sambit N Bhattacharya²⁰, Thangakunam Balamugesh²¹, Uday Pratap Singh²², V Ramesh²³, Vineet Ahuja²⁴, Vishal Sharma²⁵, Vishali Gupta²⁶

¹Pulmonary & Critical Care Medicine, Pandit Bhagwat Dayal Sharma Post Graduate Institute of Medical Sciences, Rohtak; ²Pulmonary Medicine, Postgraduate Institute of Medical Education and Research, Chandigarh; ³Orthopedics, University College of Medical Sciences, New Delhi; ⁴National Tuberculosis Elimination Program, Govt of India, New Delhi; ⁵Parmanand Deepchand Hinduja and Medical Research Centre, Mumbai; ⁶Obstetrics and Gynaecology, All India Institute of Medical Sciences, New Delhi; ⁷Uveitis & Ocular Pathology Department, Sankara Nethralaya, Chennai; ⁸Medical Microbiology, Postgraduate Institute of Medical Education and Research, Chandigarh; ⁹Microbiology, Vallabhbhai Patel Chest Institute, University of Delhi, Delhi; ¹⁰Neurology, Postgraduate Institute of Medical Education and Research, Chandigarh; ¹¹ASPIRE Chennai; ¹²Obstetrics and Gynaecology, Chittaranjan Seva Sadan College of Obstetrics, Gynaecology and Child Health, Kolkata; ¹³Cardiology, All India Institute of Medical Sciences, New Delhi; ¹⁴Infectious Diseases, Christian Medical College, Vellore; ¹⁵Orthopedics, All India Institute of Medical Sciences, New Delhi; ¹⁶Obstetrics and Gynaecology, Chittaranjan Seva Sadan College of Obstetrics, Gynaecology and Child Health, Kolkata; ¹⁷Pulmonary Medicine, Postgraduate Institute of Medical Education and Research, Chandigarh; ¹⁸Neurology, All India Institute of Medical Sciences, New Delhi; ¹⁹Cardio-thoracic and Vascular Surgery, Christian Medical College Vellore; ²⁰Dr Baba Saheb Ambedkar Medical College & Hospital, Delhi; ²¹Pulmonary Medicine, Christian Medical College, Vellore; ²²Urology, Sanjay Gandhi Postgraduate Institute of Medical Sciences, Lucknow, India; ²³Employees' State Insurance Corporation Medical College and Hospital, Faridabad; ²⁴Gastroenterology, All India Institute of Medical Sciences, New Delhi; ²⁵Gastroenterology, Postgraduate Institute of Medical Education and Research, Chandigarh; ²⁶Advanced Eye Centre, Postgraduate Institute of Medical Education and Research, Chandigarh

CORRESPONDING AUTHOR

Dhruva Chaudhry, Pulmonary & Critical Care Medicine, Pandit Bhagwat Dayal Sharma Post Graduate Institute of Medical Sciences, Rohtak, Haryana

Email: dhruvachaudhry@yahoo.co.in

CITATION

Chaudhry D, Aggarwal AN, Jain AK, Ashwani Khanna, Rodrigues C, Sharma JB, Biswas J, Sharma K, Varma M, Modi M, Datta M, Jana N, Naik N, Rupali P, Malhotra R, Dey R, Aggarwal R, Bhatia R, Thankachen R, Bhattacharya SN, Balamugesh T, Singh UP, Ramesh V, Ahuja V, Sharma V, Gupta V. Adult Tubercular Meningitis. Journal of the Epidemiology Foundation of India. 2024; 2(1Suppl):S225-S226.

DOI: <https://doi.org/10.56450/JEFI.2024.v2i1Suppl.113>

This work is licensed under a Creative Commons Attribution 4.0 International License.

©The Author(s). 2024 Open Access

DISCLAIMER

This article/STW, was originally published by Indian Council of Medical Research (ICMR) under Standard Treatment Workflow. The reprinting of this article in Journal of the Epidemiology Foundation of India (JEFI) is done with the permission of ICMR. The content of this article is presented as it was published, with no modifications or alterations. The views and opinions expressed in the article are those of the authors and do not necessarily reflect the official policy or position of JEFI or its editorial board. This initiative of JEFI to reprint STW is to disseminate these workflows among Health Care Professionals for wider adoption and guiding path for Patient Care.

**Standard Treatment Workflow (STW) for the Management of
ADULT TUBERCULAR MENINGITIS**

ICD-10-17.0

**SUSPECT TBM WITH
FOLLOWING CLINICAL FEATURES**

- Fever (Duration of 5 days or more*1)
- Headache & Vomiting
- Altered sensorium
- Cranial nerve palsy
- Hemiparesis/any limb weakness
- Seizures
- Neck pain and stiffness

**ALWAYS ENQUIRE FOR
ASSOCIATED FEATURES**

- Constitutional symptoms
- Active TB elsewhere
- Past history of TB & ATT
- Contact with TB patient
- HIV seropositivity
- Low socio-economic status
- High endemic area

*This is to increase sensitivity for diagnosis of TBM. The duration could be variable from days to weeks to months.
†Clinical judgement & evaluation of other conditions is also required as fever can be associated with headache in other medical conditions. Delaying work up for meningitis is not recommended.

IF TBM SUSPECTED

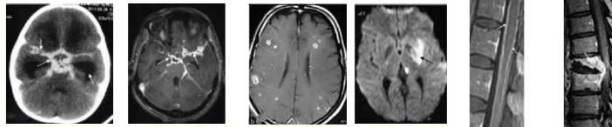
Refer to a centre where facility of evaluation (at least Lumbar puncture & CT scan) is available.

EVALUATION AT CENTRE OF CARE

CLINICAL HISTORY & EXAMINATION

- Symptoms type & duration, onset & progression
- Headache, altered sensorium, focal deficits
- Neck rigidity, Kernig's sign
- Cranial nerve palsy
- Fundus examination - papilledema

COMMON NEUROIMAGING FINDINGS IN TBM



Basal exudates and Hydrocephalus Tuberculomas Infarction Arachnoiditis Pott's spine

LABORATORY EVALUATION

- CBC, ESR, CRP
- LFT, RFT, Electrolytes
- Blood sugar, HIV
- Chest X Ray- PA view
- USG whole abdomen
- Mantoux (optional)

IMAGING

- NCCT/CECT head- Preferred as initial investigation
- MRI brain (and spine if indicated) in selective cases

CSF

- Mandatory- Should be sent for essential analysis (Box 1)
- Prudent to perform CT head prior to CSF in presence of papilledema &/or focal deficits

CSF EVALUATION*

01

ESSENTIAL

- Cell count & type
- Protein
- Sugar (& Corresponding blood sugar)
- NAAT
- Grams stain
- Bacterial culture
- AFB stain
- AFB culture/sensitivity
- India Ink**
- Cryptococcal antigen**

02

DESIRABLE

- Fungal smear & culture
- Cytopathology*

03

OPTIONAL

- Wet mount
- VDRL
- Toxoplasma PCR†
- Viral PCR

If some tests are not available at site, store sample in sterile container, keep in refrigerator & transport in icebox to other facility

*CSF samples should be sent to the lab as soon as possible for examination of cells, protein, sugar and cytology.
**Cryptococcal meningitis should be excluded wherever possible as it is a close differential diagnosis of TBM.
†In ideal settings, it may be prudent to exclude a diagnosis of carcinomatous meningitis.
‡Especially in patients with HIV.

CSF FINDINGS IN TBM AND OTHER MENINGITIS

MENINGITIS TYPE	CELL COUNT	PREDOMINANT CELL TYPE	PROTEIN	SUGAR	SPECIFIC TESTS FOR CONFIRMATION
Tubercular	Usually <500	Lymphocytic Neutrophilic in some acute cases	High	Low	AFB smear & culture NAAT**
Pyogenic	In thousands	Neutrophilic	Moderately High	Very low	Gram stain, culture
Fungal	Variable	Lymphocytic	High	Low	India Ink, Fungal Culture, Cryptococcal antigen
Viral	50-500	Lymphocytic	Normal to marginally high	Normal	PCR for specific virus

*A negative NAAT result does not rule out TBM. The decision to give ATT should be based on clinical features and CSF profile.
**NAAT: Xpert/TrueNat

MANAGEMENT

ANTI-TUBERCULAR TREATMENT

- Intensive Phase: 2 months of RHZE or RHZS
- Continuation phase: 3 drugs: RHZ† for at least 10 months
- Preferably Dexamethasone 0.4 mg/kg/day intravenously in 3-4 divided doses during hospital stay
- If not feasible, give oral Dexamethasone 0.4 mg/kg/day in divided doses or oral Prednisolone 1 mg/kg/day in single morning dose
- Discharge on oral steroids on tapering doses for a total duration of 8-12 weeks

†Treatment duration may be increased in some cases as per the clinician decision.
‡This is as per strong recommendations of concerned specialty experts in view of high toxicity of Ethambutol on TBM. These recommendations have been sent to NTEP.

FOLLOW UP

- Regular follow up is essential every month for at least first 3 months & can be increased thereafter till treatment is stopped
- Monitor liver function tests & any other features of drug toxicity
- Observe for clinical improvement or any deterioration
- Closely observe for development of any complications

SUSPECT COMMON COMPLICATIONS

- **Hydrocephalus and raised ICP:** Worsening of headache with vomitings and/or altered sensorium
- **Optico-chiasmatic arachnoiditis:** Complaints of vision loss in one or both eyes with or without headache
- **Myelitis and/or arachnoiditis:** Development of paraparesis or quadriparesis with/without sensory disturbances, bladder involvement
- **Epidural abscess/Pott's spine:** Complaints of back pain and/or weakness in one/ both lower limbs/bladder/bowel disturbances
- **Tuberculomas:** Seizures, new onset focal focal deficits, worsening headache
- **Seizures:** Consider tuberculoma/electrolyte or metabolic imbalance/ cerebral infarction
- **Cerebral infarction and stroke:** Sudden onset weakness of one half of body, new onset confusion, altered mental status, seizures
- **Hyponatremia, SIADH:** Persistent or worsening mental status

ABBREVIATIONS

ATT: Antitubercular therapy	E: Ethambutol	MRI: Magnetic resonance imaging	R: Rifampicin
CBC: Complete Blood Count	ESR: erythrocyte sedimentation rate	NAAT: Nucleic Acid Amplification Test	RFT: Renal function tests
CECT: Contrast Enhanced CT	H: Isoniazid	NCCT: Non-contrast CT	S: Streptomycin
CRP: C Reactive Protein	ICP: Intracranial pressure	NTEP: National TB Elimination Programme	SIADH: Syndrome of inappropriate antidiuretic hormone
CSF: Cerebrospinal Fluid	LFT: Liver function tests	PCR: Polymerase Chain Reaction	TBM: Tubercular meningitis
			Z: Pyrazinamide

REFERENCES

1. Thwaites G, Fisher M, Henningway C, Scott G, Solomon T, Innes J. British Infection Society, British Infection Society guidelines for the diagnosis and treatment of tuberculosis of the central nervous system in adults and children. J Infect. 2009;59:167-87.
2. Thwaites GE, Chau JT, Stepienewska K, Phu NH, Chinh LV, Sinh DX, White NJ, Parry CM, Farrar JJ. Diagnosis of adult tuberculous meningitis by use of clinical and laboratory features. Lancet. 2002;360:1287-92.
3. Vohra D, Bhatia R, Prasad R, Srivastava MV, Tripathi M, Kumar G, Singh MB, Bhatia R eds. Emergencies in Neurology, 2nd edition. 2021; 114:639-44.
4. Modi M, Prabhakar S. Fever and altered sensorium. In: Singh MB, Bhatia R eds. Emergencies in Neurology, 2nd edition. 2021; 91-106.
5. INDX TB guidelines. <https://tbclinia.gov.in/showfile.php?fd=3245> Last access on 05/03/2022.

This STW has been prepared by national experts of India with feasibility considerations for various levels of healthcare system in the country. These broad guidelines are advisory, and are based on expert opinions and available scientific evidence. There may be variations in the management of an individual patient based on his/her specific condition, as decided by the treating physician. There will be no indemnity for direct or indirect consequences. Kindly visit our web portal (stw.icmr.org.in) for more information.
© Indian Council of Medical Research and Department of Health Research, Ministry of Health & Family Welfare, Government of India.